



Software and Systems Integration: A Historical Perspective



During the Cold War era, military strategy was predicated on the belief that deterrence was assured through arms superiority—the ability to impose overwhelming force and mass on a global scale. These capabilities were achieved through scientific management principles imposed on a capital-intensive industrial base. This approach achieved significant economies of scale. But industrial management principles reinforced a functionally segregated “stovepipe” perspective within the defense establishment.

With the end of the Cold War, industrial-strength deterrence was no longer sufficient. Operational advantage now derives from speed, agility, and precision, which encourages adaptive planning, accelerated cycle times, and a collaborative approach to problem solving. Over the past decade, the DoD acquisition process has been realigning itself from a “system centric” to an “enterprise-wide” or “capabilities-based” paradigm. This strategic redirection reflects fundamental changes in national defense, driven by historic changes in the geopolitical landscape. Individual systems are not only becoming larger and more complex, but most are now expected to be integrated across a complex enterprise. The problem is further exacerbated by the fact that many programs lack a full appreciation of the extent of these integration efforts and therefore underestimate the work effort.

With more than four years of systemic analysis data gathered by the Systems and Software Engineering Directorate on program reviews, our engineers see that a lack of systems and software integration has caused many programs to perform in a suboptimal manner, contributing to cost, schedule, and performance issues. Functional specialization has its role, but successful system development could benefit from increasing multidisciplinary and collaborative approaches across engineering specialties and throughout the life cycle—in particular, attention to engineering early in the development life cycle.

This month’s CROSSTALK features excellent articles on the topic of software and systems integration. In *Leveraging Federal IT Investment With Service-Oriented Architecture (SOA)*, Geoffrey Raines examines how an SOA offers federal senior leadership teams an incremental and focused path forward in utilizing decades of IT investment in existing systems. Five authors take an insider look at the Lockheed Martin Aeronautics Company’s *Requirement Modeling for the C-5 Modernization Program*, detailing the process and showing its benefits. Paul E. McMahon explains how Agile techniques can help with the evolutionary acquisition of defense systems in *Defense Acquisition Performance: Could Some Agility Help?*

There are also two informative supporting articles this month that outline exactly what their titles suggest, with *A Model to Quantify the Return on Investment Assurance* by Ron Greenfield and Dr. Charley Tichenor, and Dr. Kelvin Nilsen’s *Enforcing Static Program Properties in Safety-Critical Java Software Components*.

As you consider the thoughts in these articles, remember that the software and system engineer’s role in combating global emergent threats is no less compelling than that of the front-line warriors whose lives often rest on how well we do our job. We should undertake our tasks with a dedication worthy of the challenge, and take a corresponding amount of pride in our accomplishments. As such, we should strive to coordinate and cooperate in order to accomplish the development of new systems better, faster, and at a reasonable cost.

Bruce Amato

*Assistant Deputy Director, Software Engineering and Systems Assurance
Office of the Deputy Under Secretary of Defense, Acquisition and Technology*